SCIENCE

FRIDAY, NOVEMBER 4, 1887.

THE NUMBER OF PERSONS who have been killed by explosions in mines during the past fifty years is 11,000, as stated by Mr. Ellis Lever in a recent number of the London *Times*. This number is, however, only a small proportion of those who have met their deaths by colliery accidents. The number of deaths through accidents of all kinds in mines since the Queen's accession is nearly six times greater, — 60,000, Mr. Lever says, — while 4,000,000 persons have been maimed or otherwise injured. Mr. Burt, M.P., an undoubted authority, states that the average number of those killed in mining operations is now 1,200 a year, and that 100,000 persons annually are injured in following the hazardous occupation of the miner. What are the causes which conduce to this terrible loss of human life? Mr. Lever says the want of a better and safer light is mainly responsible. The Royal Commission on Accidents in Mines has condemned as unsafe the lamps of Davy, Clancy, and Stephenson. The House of Commons confirmed the conclusions arrived at by the royal commissioners, and government inspectors of mines are now advocating and hoping for the immediate and universal introduction of the electric light into coal-mines. This state of affairs leads the English *Electrical Review* to say that it is to the electric light that the miner must look for emancipation from many of the horrible dangers to which he is subject. There are many forms of electric lamps now competing for the favor of miners and mine inspectors, and some of them possess undoubted advantages over the older types of safety-lamps. But there are also, in most of these, serious drawbacks which prevent their speedy introduction to mine uses. Weight, complication, and cost are among the principal disadvantages; and it behooves electricians to give their utmost thought to the task of overcoming the difficulties which the peculiar needs of the miner present. We have it on the testimony of Sir Frederick Abel that very great progress has been made towards providing the miner with a thoroughly safe, sufficiently portable, and generally efficient self-contained electric lamp since the Royal Commission submitted its final report; but the same authority is of opinion that strenuous exertions are yet needed before the comparatively heavy first cost of electric lamps will be so greatly counterbalanced by their durability and simplicity in construction and maintenance as to afford hope of their being generally or even very extensively substituted for oil-lamps. So that it is evident that the electrician is, in this direction as in many others, still behind the needs of the age, and behind what is expected of him.

AN EARLY MAP OF THE FAR WEST.

THE classic transcontinental expedition of Captains Lewis and Clarke, under instructions of President Jefferson to cross the plains and mountains to the Pacific Ocean, left the Mississippi on their venturesome journey, May 14, 1804. Their first winter encampment was made among the Mandan Indian villages, not far from the present site of the town of Bismarck. During the winter of 1804–05 their time was mainly occupied in preparation for the continuation of their journey westward. They were in frequent communication with the Indians, and received occasional visits from a few straggling French *voyageurs* and traders of the North-west Fur Company, who came from their headquarters in Canada as far as the Missouri. On the eve of the departure of the expedition, the following spring, Captain Lewis sent back a number of men with despatches, journals, and collections addressed to the government at Washington.

Among the articles forwarded was a map, prepared by Captain Lewis from all available data, of the country lying between the Mississippi River and the Pacific Ocean. The information obtained of the country to the westward of their winter quarters was for the most part derived from Indians more or less acquainted with the country near the head waters of the Missouri and Columbia.

In a letter of transmittal to President Jefferson, dated Fort Mandan, April 7, 1805, Captain Lewis says, "The map which has been forwarded to the secretary of war will give you the idea we entertain of the connection of these rivers, which has been formed from the corresponding testimony of a number of Indians who have visited that country, and who have been separately and carefully examined on that subject, and we therefore think it entitled to some degree of confidence." In a following paragraph, he adds, "You may therefore expect me to meet you at Montachello in September, 1806. On our return we shall probably pass down the Yellowstone River, which, from Indian information, waters one of the finest portions of this continent."

On Feb. 19, 1806, President Jefferson, in a message to Congress communicating the discoveries of Lewis, says, "During his stay among the Mandans, he had been able to lay down the Missouri, according to courses and distances taken on his passage up it, corrected by frequent observations of longitude and latitude; and to add to the actual survey of this portion of the river, a general map of the country between the Mississippi and Pacific, from the thirty-fourth to the fifty-fourth degrees of latitude. . . . Copies of this map are now presented to both houses of Congress."

After despatching the party for the return trip, the main body of the expedition crossed the mountains, wintered near the mouth of the Columbia, and, returning, reached St. Louis in September the following year.

As is well known, they brought back a large amount of most valuable geographical knowledge. In the map compiled by Captain Clarke, published in the authorized editions of the history of the expedition (Philadelphia and London, 1814), the main features of the country are in very many essential particulars different from the way they were originally represented on the preliminary map forwarded from Fort Mandan. The map was never ordered by Congress, and, so far as I can ascertain, was never published. It seems quite probable that after the return of the expedition means may have been taken to suppress so erroneous a production. At all events, no mention is made of this map in the published history of the expedition. In their journal they say, "At the same time that we took our departure, our barge, manned with seven soldiers, two Frenchmen, and Mr. Gravelines as pilot, sailed for the United States loaded with our presents and despatches."

To-day, however, the original drawing has considerable historic interest, as it gives the opinions of the highest authorities of the time upon the physical geography of the country and its inhabitants, and at the same time presents a clear idea of the value of the aid they received from Indian guides and others.

One of the copies of this map has been preserved in the Archives of the War Department, and through the courtesy of Gen. J. C. Duane, chief of engineers, I have been able to photograph it for reproduction.

The only public reference to this map which has come to my attention is a short editorial notice in the *Medical Repository*, New York, 1806. The journal was edited by Dr. Samuel Latham Mitchell, who was also a member of the House of Representatives. While in Congress, he served upon the Committee on Commerce and Manufactures, and in that capacity advocated all measures for the exploration of the Louisiana Purchase. There is evidence to show that he was one of the pioneers in Congress in favor of the exploration of the Far West by the general government. A copy of the map accompanies this communication. It was reproduced for

other purposes, but it cannot fail to interest a large number of the readers of *Science*. By reference to the map, it would appear that Captains Lewis and Clarke received no intimation whatever of the interior drainage of the Columbia. They represent the entire area of the Great Basin and the Snake River country as drained by the Missouri and the Yellowstone. The Yellowstone, named by them before reaching it, is shown as a longer river than the Missouri, rising as far south as the 39th parallel of north latitude, near the sources of the Rio Grande. In their map published in 1814 the drainage-area is already much restricted, and the river represented as finding its source in a large lake.

It is well known to all students familiar with the history of the North-west that the Yellowstone received its name in very early times. To most visitors to the Yellowstone National Park, however, the origin of the name is always a matter of special inquiry. It may be well, therefore, to add that Lewis and Clarke encamped near the junction of the Missouri and Yellowstone, April 26, 1805, seventeen days after leaving Fort Mandan. In their journal occurs the following: "This river, which had been known to the French as the *Roche jaune*, or, as we have called it, the Yellowstone, rises, according to Indian information, in the Rocky Mountains; its sources are near those of the Missouri and the Platte, and it may be navigated in canoes almost to its head."

On the map there is one very significant designation to a comparatively small river quite remote from the country the party intended to traverse. In the region which has since been set apart as the National Park a small stream is shown tributary to the Yellowstone River, and curiously designated as 'Stinking Cabin River.' 'Brimstone' and 'Stinking Water' are names found on the maps of this region since the days of Colter's trip through the Yellowstone Park region, in 1807. But this still earlier name suggests that some adventurous *voyageur* unknown to history had already penetrated the country which has since become world-renowned for its remarkable thermal waters.

On the north side of the Missouri, Milk River is well represented on the map, but undesignated except by the amusing note, "The Indians call this the river which scolds at all other rivers."

The coast-line of the Pacific and Puget Sound is of course taken from early English admiralty charts, and doubtless in the possession of the distinguished explorer, Meriwether Lewis.

ARNOLD HAGUE.

SANITARY SCIENCE AND EDUCATION.[1]

GENTLEMEN, — When I accepted the invitation of your president to participate in this discussion, it was not in the hope of being able to add any thing to the general store of information on sanitary topics, for sanitation and hygienic science are subjects that, on their technical side, I know very little about; but I accepted Dr. Newton's invitation because as a teacher, and one who is engaged in the training of teachers, I desired to express my appreciation of the importance of sanitary science for sound educational doctrine and correct educational practice, and to add my testimony to that of the other gentlemen who are to address you, to the fact that your researches and conclusions are of the greatest practical value to us.

Mens sana in corpore sano is as much to be prayed for now as it was in the time of Juvenal, and we are far better equipped than was the satirist or his contemporaries to work toward that end. The sound mind and the sound body seemed to the Roman to be two distinct and separate things whose conjunction was desirable. We have come to know that the two are so intimately related, indeed so interdependent, as to be practically one thing. Aristotle furnished the educators of antiquity with a psychology upon which to base their praxis. It was a wonderful achievement. But the great modern science of physiology, whose beginnings are to be seen in the discoveries of Servetus, Harvey, Leeuwenhoeck, and others, compelled the entire rewriting of that science; and the result is an infinitely more complex and accurate and practical, though less final psychology, than that which was bequeathed to us by the great Stagyrite. This new psychology has taught us how truly vital the dependence of mind on body is. We know, for example, that a decreased or impoverished supply of blood to the brain produces mental inertia and lassitude. We know that an organ develops by exercise, and that the neglect of an organ or its excessive stimulation is alike harmful, no matter whether the organ be mental or physical. We can promptly and surely trace the mental results from unduly intense or too prolonged brain-work, from lack of exercise, and from improper nutrition. We are aware, in like manner, of the bodily results induced by the various emotions and passions, by expectant attention, by concentrated will-power, and other mental phenomena.

Now, it seems to me that it is just at this point that the sanitarian and the educator join hands. Both having a full understanding of the relation that subsists between mind and body, the former brings the results of his studies to the latter, and formulates them into suggestions and rules for the teacher's guidance. The teacher, in return, adopts these suggestions and rules as parts of his science, and communicates to the sanitarian in due time the effects that follow such adoption. Thus sanitary science is aided in one of its most important applications, and the science of education adds a most valuable chapter to its book.

Perhaps this co-operation of sanitarian and educator is more ideal than real, but it is nevertheless far more noticeable now than it was twenty-five or even ten years ago. This is proved, if proof be needed, by the fact that instruction in physiology and hygiene, and in the mental and physical effects of stimulants and narcotics, has been generally added to the curriculum of the common school within that period. It is not to be disputed, on the other hand, that much remains to be done. An illustration of this will be found in one of the opening pages of a recent book on the ventilation and warming of school-buildings, by Mr. Morrison of Kansas City. The author reminds us (p. 18) that "no subject has been more carefully and intelligently studied than the direct and ultimate effects of improper air on the human system, and that on no subject is there greater unanimity of competent opinion." School-building goes on, however, year after year, and it goes on in too many cases utterly regardless of whether a child vitiates two cubic feet of air per hour or two thousand cubic feet, whether 62° F. is the better average temperature or 82°, or whether 45 per cent of saturation is desirable in the atmosphere or 70 per cent. Nevertheless, science and common sense are making headway, and there is every reason to believe that in a few years' time all the school-buildings that are erected, however humble and unpretentious they may be, will be well ventilated and properly heated.

You will pardon, Mr. President, my apparent digression from the four specified subjects of this evening's discussion, for it seems to me that it is only on such broad lines as those which I have indicated, that these questions can profitably be considered. It would be no great advantage were we to bring together a mass of merely empirical statements. We must get below the statements to the facts and principles which explain them. We want to get at the philosophical and scientific reason for the relation that sanitation bears to education. We want to understand exactly what it is that is common to both sciences. That much being clearly before us, the application of the results of the former science to the problems of the latter is not a difficult matter.

The educational topics before you are four: (A) the length of school days and terms, (B) recesses, (C) competition, (D) industrial education. I shall pass over the first two in order to say a word about each of the others. These are competition and industrial education. Permit me a few words concerning each.

Competition may be defined as a common striving for the same end. It involves two or more competitors. As a principle it has long been dominant, not only in business-life, but in the science of economics. It has been prescribed as the proper stimulus for all stagnation, and as the solvent for all difficulties. Of late years, however, a school of economic thinkers has arisen which asserts that unrestricted competition is an evil to humanity and to the State. We are told that it is proved to be demoralizing, destructive, and, as a principle of political economy, inefficient. Have not you sanitarians and have not we teachers reached an analogous conclusion as to competition in our common field? Is not competition, when

[1] Abstract of an address by Nicholas Murray Butler, Ph.D., president of the Industrial Education Association's College for the Training of Teachers, delivered at the thirteenth annual meeting of the New Jersey Sanitary Association, held at Trenton, Oct. 28, 1887.

left to itself, in danger of emphasizing material success at the expense of the disciplinary process? I take it we are all agreed that how a pupil learns is of more importance than what he learns. His faculties are developed and his character formed by the process of learning, far more than they are by the thing learned. The tendency of unrestricted competition is to alter this relation, to exalt the result, and to depreciate the process. This is contrary to the teaching of mental hygiene, and in consequence is to be condemned by sanitarians and educators alike. I say nothing of the pallid faces, the disordered nerves, the sleepless nights, and the loss of appetite, that result from competition for competition's sake. Were those results not present, I should still oppose it as an unsound educational principle. Therefore I repeat, competition must be restricted and kept within reasonable bounds. This topic gives rise to many other fruitful suggestions, but I must pass them by.

There remains the subject of industrial education. Let me, in as few words as possible, place that properly before you, and then I am confident that the attitude toward it of a science of sanitation that is broad enough to demand a well-developed mind in a well-developed body will not be for a moment doubtful.

Industrial education is not technical education, the preparation for trades. It is a term invented to signify an education in which mental training through the hand and the eye occupies its proper place beside mental training through the memory and the other means of approach to the mind. Mental training through the hand and the eye is generally known as 'manual training,' which term is only satisfactory in case its proper signification is understood. This manual training is graded instruction, the object of which is to develop the pupil's powers of expression. No piece of knowledge is really our own until we can express or apply it. Mere memorized knowledge is parrot knowledge. It is mentally indigestible and innutritious. It is the pastry of the intellect. Well enough, perhaps, if taken in proper quantities and at proper times, but very unsatisfactory and unwholesome as a steady diet.

Reading and writing both appeal in a measure to the child's powers of expression, but not sufficiently nor in the most natural and simplest way. Expression by means of language is abstract and comparatively difficult. When carried to any great degree of fluency or accuracy, it is universally looked upon as an accomplishment. The earlier and simpler methods of expression are by gesture, by delineation, and by construction. Industrial education takes these powers of expression, delineation, and construction, and trains them together with the other faculties. Drawing and construction, the latter in material suited to the strength and capacity of the pupil, are reduced to a system, and go hand in hand with instruction in the three R's. Thus the sense of form, of proportion, of accuracy, and of truth is developed as is possible in no other way. The judgment and the executive faculty, the most important of all our powers in the practical work of life, are provided for and trained in the scheme of industrial education, though accorded no place in the old-fashioned curriculum.

Now, sanitation has been called the 'science of preventive medicine,' and lectureships with that title have been founded in Great Britain. In connection with this description of your science, let us remember that we are told on high authority that the number and variety of diseases and disorders that are traceable to the mind are rapidly increasing. If this statement is true (and I know of no reason to doubt it), in what direction can our sanitarians better expend their energies than in furthering the adoption and development of an educational system that is complete, that is thorough, and that is healthy? This is certainly a proper field for the activities of 'preventive medicine.'

Time will not permit me to follow out this suggestive theme. I will simply state, in conclusion, a few of the reasons why I consider industrial education a matter of importance to sanitarians. In industrial education, properly organized and administered, I claim that we have for the first time a system that trains all the mental faculties, and each at the proper time and in proper proportion. It gives us no abnormal and mechanical memories without judgment and executive ability, no hunched backs without arms and legs. Every faculty is considered, every power is taken into account. The conditions of nineteenth-century life are kept in mind, and the ideally educated man is not held to be the mediæval recluse or the eighteenth-century English gentleman. Incidentally, industrial education affords a pleasant and healthful alternation of exercise from faculty to faculty. No one is overstrained, no one is allowed to become atrophied and die. Muscular exertion is called in to supplement and relieve mental activity.

My own belief is that the mere recital of these facts determines the attitude of sanitarians toward the system which permits and causes them. As friends of educational and scientific progress you will approve industrial education, and then as sanitarians you will indorse it as a long step toward the much-to-be-desired *Mens sana in corpore sano.*

THE AMERICAN ORIENTAL ASSOCIATION.

THE fall meeting of the American Oriental Society was held on Oct. 26 and 27, at the Johns Hopkins University. Since the establishment of this university a little over ten years ago, Baltimore has grown to be one of the great centres of education and learning in this country. A 'university' atmosphere pervades the place, and the large audience that gathered in Hopkins Hall at the opening session on Wednesday afternoon may be taken as an indication that the interest felt there for higher studies and researches extends to regions that seem (but only seem) to lie so far off as those covered by the Oriental Society.

In the absence of Professor Whitney, who, although considerably improved in health, is still obliged to be sparing of his strength Vice-President Dr. W. H. Ward of New York presided.

The reading of papers was begun by Professor Haupt of the Johns Hopkins, who presented the prolegomena to his forthcoming Assyrian grammar, — a work on which he has been engaged for a number of years. The extent of the literature in cuneiform characters is appreciated only by very few persons; and even of those present at the meeting, no doubt quite a number were surprised to learn, that, as far as known to us, it covers a period of at least forty centuries. There is a short inscription of King Sargon of Agade, the date of which can be fixed with certainty at 3800 B.C., and on the other side Antiochus Soter (280–261 B.C.) tells us in a cuneiform tablet of a temple he had erected in honor of a Babylonian deity. Professor Haupt, after speaking of the various periods to be distinguished in Babylonian-Assyrian literature, dwelt at length on some of the features of the Assyrian language, showing, more especially, the relationship that existed between it and the cognate Semitic tongues. In a brief discussion of the paper, Professor Jastrow, after alluding to the eagerness with which students and scholars have been looking forward for some time to the grammar of Professor Haupt, who stands to-day without a superior, and with but few equals among Assyriologists, spoke of the 'Sumero-Akkadian' controversy, which is attracting considerable attention just at present. He regretted the confusion which incautious writers are bringing about by unnecessarily complicating the points at issue with questions and theories that have no bearing on the subject.

Professor Bloomfield followed with an exhaustive study of certain magical rites in cases of disease, as laid down in the Athavar-Veda. Professor Lyon of Cambridge announced the recent purchase by the Harvard University of a collection of Babylonian so-called 'contract tablets.' These tablets, of which the British Museum possesses many thousand specimens, have afforded us a wonderful insight into the daily life of the ancient Babylonians and Assyrians. They show us that legal proceedings were quite as complicated in days of antiquity as they are to-day; they give evidence of extensive commerical transactions in those days; and, while the lengthy inscriptions of the kings give us valuable information of the wars and campaigns, these little bricks tell us much of the ways and manners of the people.

The most interesting feature of the convention was the gathering, at the residence of President Gilman, of the university in the evening, which partook partly of the nature of a reception, and in part of an informal session of the association. Besides the members of the Oriental Society, a number of prominent gentlemen, including some of the trustees of the university, had been invited. President Gilman welcomed his guests in a few well-chosen remarks, where-

upon Mr. H. F. Allen, a fellow at the Johns Hopkins, made the announcement that the Semitic seminary of the university proposed publishing at an early date a complete Assyrian glossary. The work would be issued under the superintendence of Professor Haupt, and, while not intending to supersede the great Assyrian dictionary now in course of publication by Prof. Friedrich Delitzsch of Leipzig, will aim to supply the need of students of Assyrian better than the latter work does. The principles which will guide the compilers in their work were briefly set forth. Professor Haupt followed with a second announcement, also of great interest to Semitic scholars, regarding a series of contributions to Semitic comparative philology, which he proposes editing in conjunction with the above-mentioned Professor Delitzsch; and it must have seemed to many as though an Assyriological 'craze' had broken out when Dr. Cyrus Adler added a third announcement, which was no less gratifying than the preceding ones.

The National Museum at Washington has recently entered into an arrangement with the Johns Hopkins University with a view of obtaining as complete a collection as possible of facsimiles and casts of seals coming from Mesopotamia, and to include eventually in the collection also important cylinders and tablets bearing cuneiform inscriptions. The beginning will be made with the antiquities scattered throughout the museums and private collections in this country. Besides the copy of each piece to be deposited in Washington, another copy will be given to the Johns Hopkins, in consideration of which the latter institution will superintend the collection at the national capital. The project is one which promises to arouse considerable interest; and the hope that it may yet lead to an exploring and excavating expedition from this country to the mounds in Mesopotamia, which still harbor such untold treasures, may not be an utterly futile one.

President Gilman exhibited photographs of the famous Greek manuscript, 'The Teachings of the Apostles,' the discovery of which some years ago created a veritable sensation. The original manuscript is in an Eastern monastery, but the photographic reproductions are executed with an excellence that makes them fully as reliable for students as the original copy. Dr. Binion of Baltimore had some specimens of a magnificent illustrated work on the art of ancient Egypt, which he is about issuing. The cost of the work, which will contain all the important Egyptian monuments, will be one hundred and fifty dollars a copy. Professor Frothingham closed the interesting programme with a description of a monastery he recently saw in Italy, dating from the Byzantine period, and which possesses a most remarkable twelve-sided tower, — the only instance of the kind in the world.

Thursday morning again found the members in Hopkins Hall. Professor Lanman presented a brief paper from Professor Whitney. Dr. Peet had an interesting treatise on animal and sun worship among the American Indians, which brought forth some curious points of coincidence between the religious notions of the Indians and other ancient peoples. Dr. Cyrus Adler of the Johns Hopkins presented two papers bearing on Assyriological research. One of these treated of the views of the Assyrians on life after death. They believed in a future life, but the notion of a future punishment does not seem to have arisen among them, nor do we find that any distinction is made by them between the abode of the good and of the wicked. It is probable that they supposed all would share in the life to come.

Professor Hopkins of Bryn Mawr called attention to some proverbs in the Mahabharata paralleling those found among other nations. Among these, there is the 'golden rule,' which, however, is formulated negatively in the Sanscrit: "Do not unto others what thou wouldst not have others do unto you." A discussion followed in which several members participated. Professor Lanman remarked that in Chinese the maxim also has the negative form, as is also the case in the Talmud, where the saying is put in the mouth of the famous rabbi Hillel.

Mr. Allen had a suggestive paper on a proposed method of transliterating the letters of the Semitic languages. There is scarcely any point in regard to which scholars differ so much as in the method of reproducing the Semitic sounds, and yet it is eminently desirable that some uniform method be adopted. The system proposed by Mr. Allen endeavors to proceed upon the principles of phonetics, and has at least the advantage of simplicity; but whether it will meet with the approbation of scholars remains to be seen.

Further papers were presented by Dr. Ward on some Babylonian mythological symbols; by Professor Bloomfield on 'The Fire-Ordeal Hymn in the Athavar-Veda,' by Dr. T. W. Jackson; and finally one — which, however, was only read in abstract by Professor Lanman — from Mr. Rockhill, of the American legation at Pekin, on the relations of Corea to China. Mr. Rockhill is engaged in important researches which promise to clear up many obscure points in Chinese history. In a communication to Secretary Lanman, he cites an instance to show how untrustworthy the ordinary information concerning China is. It seems that in the recent census an entire province was overlooked, which contained some sixty million inhabitants; so that the figures usually given must be changed to three hundred and seventy-nine millions. A number of new members, both corporate and corresponding, were elected, and the following honorary members: Sir Henry C. Rawlinson, the well known Assyriologist, and editor of the great publication undertaken by the British Museum, 'The Cuneiform Inscriptions of Western Asia;' Prof. George F. Bühlan, a distinguished Sanscrit scholar of Germany, and editor of the latest volume of the 'Sacred Books of the East;' and Prof. Edward Sachan of the University of Berlin, who has been called to take charge of the Oriental institute which has just been established by the German Government for the training of diplomates and officials in the Eastern service. All the chief European capitals, with the exception of London, now possess institutions of this nature, where the important Oriental languages are taught, and it has been said that the Emperor of Brazil contemplates the establishment of one at Rio Janeiro. The Berlin school has opened with the amazingly large number of one hundred pupils.

The next meeting of the Oriental Association will be held in Boston during the month of May, 1888.

HEALTH MATTERS.

Cholera Cases at Quarantine.

In *Science* of Oct. 14 we noted the arrival at New York of the steamship 'Alesia' from Italy, with cholera on board. Since then another steamer, the 'Britannia,' from the same ports, has arrived. This vessel was detained at quarantine, and during this detention one of the passengers, a child, was taken sick with what is now known to have been cholera. Two other cases of cholera have developed on this same vessel, the latter of them on Oct. 24. It is said that the report of the surgeon of the vessel gave not the slightest indication of the existence of cholera on board, and it is more than probable, that, had not the arrival of the 'Alesia' with developed cholera on board occurred prior to that of the 'Britannia,' the cases of cholera which occurred on the latter steamer would have first been heard of in some hotel or boarding-house of New York.

So far as we have seen, no statement has yet been made of the health of the passengers and crew of the 'Britannia' during the voyage from Italy to New York. It would be criminal on the part of the surgeon of that steamer to have concealed the fact if cases of cholera occurred during the voyage; and, if they did not, it would seem to be a warrantable inference that cholera may develop on a ship even after a voyage across the Atlantic, and that, as happened in the case of the 'Britannia,' the health-officer is justified in detaining in quarantine a vessel from ports in which cholera is known to exist, even though she may not have had sickness on board during the voyage. It is stated that urgent demands were made on the health-officer to permit the 'Britannia' to come to the city without detention, and that it was claimed that the sickness of the child passenger was simply cholera-infantum.

Dr. Smith is to be congratulated on having exercised the authority which the State has conferred upon him, in having detained the 'Britannia,' and he may be assured that the people of this great country will uphold him in the exercise of the most arbitrary powers so long as the public health is in the imminent danger that it is in at the present time. A lack of intelligent action now may result in the introduction of cholera germs, which, though they may lie dormant during the winter, may result in a plentiful harvest when next summer comes.

AMERICAN CATTLE-PLAGUE. — Dr. Frank S. Billings, director of the patho-biological laboratory of the State University of Nebraska, claims to have discovered the germ of the American cattle-plague, commonly known as Texas-fever. This germ, he says, belongs to that class of septic germs represented by our swine-plague and rabbit septicæmia. It is a bacterium. It colors at its poles, and has a clear or non-coloring middle piece to its body. It has a motility in hanging drop-cultures, and also in the blood serum from the original blood of a diseased animal. Dr. Billings gives no experimental evidence to support his claim, but states that this will follow in course of time.

HEALTH OF PRISONERS. — Dr. Watkins, inspector of the State Board of Health of Louisiana, has recently examined the prisoners in the parish prison of New Orleans. He found a number of the inmates suffering from acute dropsy of the legs, arms, face, and body, due to confinement and insufficient and unwholesome food. Each prisoner is allowed a piece of bread and a pint of tea early in the morning, and one meal consisting of soup, the beef cooked in the soup, and bread. The beef is supplied by a contractor at five cents and a half per pound, and has been repeatedly condemned by the resident surgeon.

TYPHOID-FEVER CONTAGION. — We have repeatedly called the attention of our readers to what we believe to be a dangerous error in the management of typhoid-fever. The tendency to look upon drinking-water as the usual, if not indeed the only, channel by which the disease is propagated, is so prevalent among sanitarians and physicians, that other means are very liable to be overlooked, and the necessary precautionary measures neglected. An instance of the probable communication of this fever by other instrumentality than water is reported by M. Bonamy of Nantes. Two households used drinking-water from the same source. In one six cases of typhoid-fever occurred, four of which were fatal: in the other no cases occurred. It is true that this is negative evidence. It is, however, notwithstanding, of some value; not perhaps taken alone, but in connection with other facts which have from time to time been recorded touching the methods by which typhoid is propagated.

SCARLET-FEVER IN LONDON. — Scarlet-fever is very prevalent in London, there being in the hospitals alone nineteen hundred cases under treatment.

YELLOW-FEVER AT TAMPA. — The disease which appeared in Tampa, Fla., in the early part of October, has developed into undoubted yellow-fever. To Oct. 24 there had been 180 cases reported, with 27 deaths. Under the auspices of the United States Marine Hospital Bureau, a hospital has been provided, and a corps of experienced nurses has been obtained from Savannah to take care of the sick. The weather is very favorable for the spread of the fever, and the extension of the disease to the suburbs of the town is conceded.

EXPLORATION AND TRAVEL.

The Kuango.

MR. MENSE, who accompanied the energetic missionary Grenfell on his exploration of the lower Kuango, has described the interesting journey in a lecture delivered before the Geographical Society of Berlin. He describes the exploring of the tributaries of the Kongo as not connected with great difficulties, which only begin when an overland journey is attempted. In the trip up the Kuango a lady even participated. The principal difficulty was the obtaining of fuel for the boiler of the steamboat. Food was plentiful, as the river swarmed with hippopotamuses. In many places their meat could be bartered for fuel. When arriving near Kindjungi, a reef running right across the river, the hippopotamuses got scarce, but in their stead an abundance of shell-fish was found. The intercourse with the natives was generally peaceable; but, as those tribes who had hostile intentions had no fire-arms, their attacks were not dangerous. Grenfell had provided his steamer with a net of steel, which protects the crew and the passengers from the arrows. The reef Kindjungi stopped the progress of the expedition. The river forms a fall three feet in height, and has dangerous whirlpools. It rushes through a narrow gorge cut about a thousand feet into the plateau, which consists of laterite. The tribes inhabiting this district have had no intercourse with Europeans. They wear self-manufactured clothing, and their language differs from those spoken near Stanley Pool. The country is thickly wooded, and caoutchouc is found in considerable quantities. Elephants and buffaloes are numerous, but there are only few villages. The lower part of the river runs through a grassy plain, while near Kindjungi the country becomes mountainous. As Major von Mechow descended the Kuango to Kindjungi, and as Dr. Büttner reached its middle course coming from the west, the position of the whole river is now fairly laid down.

TRAVELS IN AFRICA. — Captain van Gèle's attempt to reach the Welle, according to *Le Mouvement Géographique*, has unfortunately been unsuccessful. When he arrived on the upper Itimbiri, he unexpectedly found the country uninhabited and poor. As he was not prepared for this, and had no provisions to last him for a journey through unknown territory, he had to return. He will probably resume his enterprise. According to the Proceedings of the Geographical Society of Berlin, Dr. H. Meyer has succeeded in reaching the summit of the Kilima Njaro, while all former travellers failed in their attempts. The summit is occupied by a crater. It is covered with snow, which sends forth a glacier that extends to a comparatively low level. The Germans are making vigorous attempts to penetrate into the extensive unknown area of West Africa. Two expeditions are being organized in Kamerun to explore the interior, which forms the watershed between the Kongo and Benue systems. Lieutenants Kund and Tappenbeck, who made important discoveries in the southern Kongo basin, will push eastward, while Dr. Zindgraff will try to penetrate into the interior in a north-easterly direction. So far, the hostility and jealousy of those tribes who command the trade between the interior and the coast have prevented all expeditions from entering the unknown country.

GREENLAND. — The Danish expedition to the coast of northern Greenland, says *Nature*, has just returned to Copenhagen. It has been absent since the spring of 1886, and was directed by Mr. C. Ryder. During the two summers it was enabled to proceed from latitude 72° to latitude 74½°. It investigated the Upernivik glacier during the winter. Many meteorological, magnetic, and astronomical observations were made, many anthropological measurements were taken, and botanical and zoölogical collections have been brought back. The investigations of the western coast of Greenland are not likely to be continued for the present. It is to be regretted if the latter statement should be true. The Danish expeditions to Greenland have resulted in so numerous and valuable contributions to our knowledge of this immense island that their continuation seems very desirable. The exploration of Melville Bay is of the greatest importance, as here many questions regarding the character of the ice of Davis Strait must be solved, and as its topography is utterly unknown; but so far the Danes have not extended their researches beyond their most northern settlement, Tassiussak, which lies at the southern extremity of Melville Bay.

BRITISH COLUMBIA. — Dr. George M. Dawson, chief of the party sent by the Canadian Government to explore the country adjacent to the Alaska boundary, has returned to Victoria. Two of his party, Messrs. Ogilvie and McConnell, will winter in the district, making astronomical observations, which will give data for the establishment of the international boundary. The expedition so far has secured a great deal of geological, geographical, and general information of the country. The point from which the doctor turned back was at the junction of the Lewis and Pelly Rivers. It is one thousand miles north of Victoria. There the flora was found to differ but little from that on the banks of the Fraser. A great deal of open, grassy country exists along the streams tributary to the Yukon. No areas of tundra or frozen swamps, such as are to be met with in the interior of Alaska, were discovered by the expedition. The doctor's conclusion is that the whole country from Cassian to the vicinity of Forty Mile Creek, on the Yukon River, yields more or less gold in placer deposits. This would constitute a gold-bearing region fully five hundred miles in length by an indefinite width, and which so far, in comparison to the area, has been very little prospected.

BOOK-REVIEWS.

Psychologie im Umrissen auf Grundlage der Erfahrung. Von Dr. HARALD HÖFFDING. Tr. from the Danish by F. BENDIXEN. Leipzig.

Essai de Psychologie Generale. Par CHARLES RICHET. Paris, Bibliotheque de Philosophie Contemporaine.

FEW philosophical reformations have a more instructive history than that which introduced experimental methods and scientific conceptions into the study of mental phenomena. The cleft between the student of matter and the student of mind had no existence in the harmonious mental culture of Greek philosophers. The nature that is the common storehouse of the *physi*cist, the *physi*ologist, and the *physi*cian, was also the mine from which the philosopher drew his lore. The great modern revival that separates the sciences, and forces a medical congress to separate into nineteen sections to insure that he who reads will be understood, has left the philosopher in the high altitudes of the mountain-top, while the busy scientists throng down into the mine. Not until our day has the philosopher taken much interest in the carloads of rich ore dug out by the miners, and come to seriously consider the announcement that this patient digging had discovered many rich veins of thought suggesting those unifying generalizations for which he was searching in the clouds. The good effects of this change of method and re-arranging of interest are easily discerned. The 'know thyself' has been interpreted as including the whole man, body and mind, past and present, as modified by all kinds of natural and artificial agencies. But the most distinctly new contribution that this revival of nature-philosophy has brought about is the origination of a scientific psychology, borrowing its methods as well as many of its facts and conceptions from other sciences, — and so re-uniting what should belong together, — while maintaining its distinct character by the use to which it puts this material, and the point of view from which it regards it.

The two volumes before us are both typical results of the new psychology. The one comes from the professor of philosophy in the University of Copenhagen; the other, from a professional physiologist of Paris.[1] Their purpose is to set forth in plain language the conclusions which experimental research and observation have allowed us to draw regarding the nature and function of psychical phenomena, and to delineate the general conceptions to which these facts give warrant. As text-books, both will be eminently useful, and an English version of either would be a welcome contribution to our literature. The point at which the works divide is that the one is written especially for those in whose minds the philosophical interest is uppermost, while the other appeals more directly to the physiologist.

Professor Höffding, while seeing in objective research the central method of psychology, fully recognizes in self-consciousness a most important supplementary means of study. Not only that we can only make our own what we assimilate to our past selves, — the deposit of a host of conscious acts, — but also that the higher mental processes are amenable to no other mode of study. On the other hand, he recognizes in consciousness a somewhat subordinate concomitant of certain psychical acts, and regards with equal interest such acts as have not this accessory; moreover, he holds that the latter can alone determine what is the 'naturally' correct mode of viewing the former. The author thus sees growing around the central 'natural' view of man several psychologies, — a physiological psychology, a psychophysics, a comparative psychology, a sociological psychology. He does not attempt a strict definition of his science, and is more anxious that it should receive the benefit of a number of lights reflected from several quarters than that it should stand out as a distinct, self-made, smoothly finished specimen.

'The experimental basis' on which this psychology rests, includes quite as much such every-day facts as are made interesting by the tact of a humane observer, as rows of formidable tables fresh from the laboratory. The criticism passed upon Wundt's 'Physiological Psychology,' that it is simply a physiology with a psychology attached, would not be applicable here. Professor Höffding makes the physiology distinctly subordinate to the psychology, while constantly utilizing the facts that physiologists have discovered. For the non-technical student this is perhaps the better plan: it retains for psychology that general broadening interest which its pursuit as a technical specialty may for a time weaken. The plan of the work is somewhat different from those of our text-books of psychology, and is an improvement upon them. After defining his point of view, he considers the relations between body and mind as well from the physiological as the philosophical point of view, and passes to the study of the conscious and the unconscious, treating the phenomena of instinct, unconscious cerebration, etc. Here, as elsewhere, his acceptance of the evolutionary theory, and his use of the analogy between the growth of the individual and that of the race, give life to his pages. He next accepts the trifold division of the intellect, the feelings, and the will, though accenting the fact that each depends upon the other, and the development of all three follow the same path. His chapters upon the mutual relations of intellect, emotions, and will, are full of sound educational material. He devotes an unusual space to the emotions, while rather slighting the will. To single out any points for special treatment would hardly be serviceable: the important aspect of the volume is its modern appreciation of the intimate connection between fact and theory. Dr. Höffding has made a distinct advance in the problem of adopting new psychological results into the body of accepted truth, which serves to educate the next generation.

The main purpose of M. Richet's work is to give a useful summary of those general propositions regarding the functions of the nervous system that have a direct psychological bearing. In this he has succeeded very well, and his success makes us realize the progress made in recent years. It is a book of this nature that impresses one with the rapidity with which mental science is taking on that long-desired scientific aspect. It is no longer meaningless to speak of psychological laws.

What M. Richet means by 'general psychology' can be best gathered from the titles of his chapters. These treat of irritability, the nervous system, reflex action, instinct, consciousness, sensation, memory, ideation, will. Under each heading the treatment is general, stating in brief the conclusions accepted by modern psychology. Within two hundred pages one has here a convenient handbook of the main principles on which an elementary course in psychology should be based.

There is one point in the volume which M. Richet has singled out for separate treatment elsewhere, and which should be noticed here. Between an ordinary reflex action and a conscious act, the author introduces a 'psychic reflex,' and by this he means all those involuntary acts which have become so by interposition of conscious, inferential elements. The dog that trembles when his master shakes a stick at him; the man who feels nausea while reading of a disaster; the vertigo experienced when looking down from a height; many kinds of laughter, as of tears, fear, pain, and pleasure, — are likewise psychic reflexes. These actions all take place involuntarily, but they would not happen if a psychic element did not intervene. Disgust would not occur if the tale were written in an unknown tongue. A psychic reflex is a response to a peripheral irritation insignificant in itself, but so transformed by an act of the mind as to put in operation the reflex centres of the spinal cord. This distinction is a convenient one, and the term will doubtless be adopted.

Ancient Nahuatl Poetry. By DANIEL G. BRINTON. Philadelphia, The Author. 8°.

THE recent volume of the author's valuable Library of Aboriginal American Literature, the seventh of this series, contains a number of ancient Mexican poems with translation, notes, a brief vocabulary, and an introduction. The poems are from a manuscript volume in the library of the University of Mexico, entitled 'Cantares de los Mexicanos y otros opusculos,' and printed from a copy made by Abbé Brasseur de Bourbourg. It is unfortunate that the author has not been able to have the texts collated with the original, but his efforts in this direction were unsuccessful: therefore it is probable that some corrections will have to be made in the texts. But scientists will nevertheless be thankful to Dr. Brinton for the publication of the interesting collection of poems

[1] M. Richet is also editor of the *Revue Scientifique*.

which are here for the first time made accessible to the student, and it is to be hoped that all that is extant of ancient Nahuatl literature will be printed ere long.

The texts are preceded by a brief introduction, in which the character of Mexican poetry is discussed. The importance of poetry, music, and dance among the Mexicans is set forth, and their method of delivering the songs is described. Of particular interest are the remarks of the author on prosody; and these are the more weighty, as he has studied this subject among many North American tribes. It is very difficult to decide whether accent or quantity is the ruling element of poetry, and the author does not attempt to decide which is more important. It seems to us that this question can only be solved by studying music and poetry jointly.

Dr. Brinton finds another wide-spread peculiarity of Indian poetry occurring in Mexican poetry. It is the inordinate lengthening of vowels and reduplicating of syllables for the purpose of emphasis or of metre, and the insertion of meaningless interjections for the same purpose. It is an interesting question whether the accent in Mexican poetry is always on the vowel, or whether certain combinations of consonants can form a syllable, as is the case in some American languages. The instrumental accompaniment of the songs is described, and the connection of the rhythm of the drums with the prosody is emphasized. In the present collection, as well as in those of other nations, we find a peculiar poetical language which makes their translation very difficult. Dr. Brinton describes this poetic dialect as abounding in metaphors. Birds, flowers, precious stones, and brilliant objects are constantly introduced in a figurative sense, often to the point of obscuring the meaning of the sentence. The grammatical structure is more complicated and elaborate than in ordinary prose writing, and rare words occur frequently. The rhetorical figure known as aposiopesis, when a sentence is left unfinished and in an interjectional condition, in consequence of some emotion of mind, is not rare, and adds to the obscurity of the wording. The last peculiarity is characteristic of the popular songs of all nations, while the occurrence of rare words may be due to the fact that many of them are sacred songs. The richness of metaphor, and the complicated grammatical structure, are also wide-spread qualities of poetry.

Dr. Brinton considers some of the songs as belonging to a time anterior to the Conquest, and gives in the brief notes which accompany each of the twenty-seven songs his reasons for this opinion. Undoubtedly most of them belong to the time of about 1500. Others are evidently ancient songs, composed before the Spaniards influenced the native customs and ideas, and this makes the present collection the more interesting. It is welcome material for the student of the Mexican aborigines.

Guatemala, the Land of the Quetzal. By WILLIAM T. BRIGHAM. New York, Scribner. 8°.

THE author terms his book very properly 'a sketch.' It is the tale of his journeys in Guatemala, adorned with some remarks on the geography and history of the country. The author does not claim to give any new information, but it is pleasant to follow him on his ride through a semi-civilized country. The book is profusely illustrated, and the illustrations have the merit of being new, characteristic, and trustworthy, most of them being reproductions of photographs. The scientific contents are selected somewhat at random, but will serve the purpose which the author has principally in view, — "to awaken among Americans greater interest in the much-neglected regions between the Republic of Mexico and the Isthmus of Darien." There are several maps in the volume, but they are of no great value. The map of Guatemala, which is claimed to have been compiled from various sources, is only a very rough sketch of that country. By far the greatest portion of the book is taken up by the author's journeys; and this is the most interesting part, as it gives a fair idea of Central American life, and valuable hints to future travellers. It is followed by a chapter on the ancient inhabitants of Guatemala, a brief history of the Republic, and a sketch of its volcanoes and produce. In an appendix, which the author compares to the attic-room of a thrifty housewife, information about a variety of subjects and a partial bibliography of Central America are given.

The Principles of Elocution. By ALEXANDER MELVILLE BELL. 5th ed., revised and enlarged. Washington, John C. Parker. 12°.

VERY many intelligent readers of the great orators, ancient and modern, must have experienced a feeling of keen regret that they themselves were unable even to approximate the directness, force, and fluency of those masters of the art of expression. It would almost seem that the power to rouse multitudes to action, to stir the deepest and most masterful emotions, to control and direct action, by the use of language, is so dangerous a one that it has been granted to but few. As a matter of fact, however, oratory or eloquence is nothing more than highly developed and cultivated power of expression. It implies the possession of something to express. The full head and the sympathetic heart are essentials.

But without aiming at the ambitious height of eloquence, there is a power of forceful and adequate expression by the use of language that belongs to us as human beings, but which is almost wholly overlooked in the training of the young. Not only is this undesirable in itself, but the conditions of our modern life render it more so. In politics, in religion, in practical life, and in social activity, men are endeavoring to communicate their own thoughts and convictions to others; and very many are the embarrassments that result from the lack of ability to properly express these thoughts and convictions. There is, therefore, a practical as well as a sentimental reason why our natural gift of expression should be cultivated.

All of this is very familiar to Mr. Bell, and, in addition, he has given so much time and study to the working-out of the practical applications of the thing, that he is to-day easily our first authority on the subject. In this last edition, the fifth, of his 'Principles of Elocution,' he has given us the ripest fruits of his thoughts and study.

Mr. Bell deprecates in his introduction the neglect of elocution, and ascribes it to two causes, — first, it is neglected because it is misunderstood and therefore undervalued; and, second, it is misunderstood because it has been confounded with recitation, and otherwise misrepresented by many writers on the subject. Mr. Bell defines (p. 6) elocution as "the effective expression of thought and sentiment by speech, intonation, and gesture." Inasmuch as it involves the exercise of language, elocution must embrace the physiology of speech. It must study carefully the instrument of speech, so that the elocutionist may have all its parts under his complete control. The author therefore takes the pupil back to respiration as the first step toward making him an expressive and agreeable speaker. Suggestions in respiration lead naturally to the principles of vocalization, and these to those of vowel formation. From this point on, the book is made up largely of practical exercises on the successive steps in the elocutionary process. These exercises and illustrations are a peculiarly valuable feature of the book; for they are not roughly thrown together, but carefully arranged on scientific principles.

We know of no higher praise of Mr. Bell's book than to say that it is pre-eminently fitted to be recognized in our high schools and colleges as the authoritative exponent of that branch of training which has too long been left out of their curriculum.

Bau und Verrichtungen des Gehirns. Von Dr. JOSEF VICTOR BOHON. Heidelberg.

Uebersichtliche Zusammenstellung der Augenbewegungen, etc. By Dr. E. LANDOLT. Tr. by Dr. H. MAGNUS. Breslau.

THESE contributions to the anatomy and physiology of the nervous system are evidences of the time and attention now devoted by the Germans to the preparation of aids to instruction whereby the student can readily obtain correct notions of his subject. Especially in the nervous system, where recent research from a variety of sources has so essentially altered the accepted views, is such an elementary reconstruction of the subject necessary. Dr. Rohon's pamphlet contains a lecture delivered before the Anthropological Society of Munich, setting forth in clear language the main outlines of current notions of the structure and functions of the brain. The main interest in the pamphlet will centre in the colored chart, which illustrates with great clearness the points referred to in the text.

Dr. Magnus presents a chart for the use of physicians and instructors, showing the main points with regard to the motion of the eyes that one ought to retain. The main laws of motion of Donders, Helmholtz, Listing, etc., are given; then a cut illustrating the origin of the motor nerves of the eye. This is followed by a table giving the origin, course, insertion, axis of rotation, etc., for each muscle of the eye. The second part of the chart explains very clearly the effect of paralysis of each of the muscles; how such paralysis limits motion of the eye; what position the eye assumes; whether double images arise, and how they are placed; and so on. The chart shows careful preparation, and will doubtless be widely used.

The Journal of Morphology. Ed. by C. O. Whitman, with the co-operation of Edward Phelps Allis, Jun. Vol. I., No. 1. Sept., 1887. Boston, Ginn & Co. 8°.

The new zoölogical periodical, the first number of which has been so long expected, has at last made its appearance in the shape of a thick and handsome volume of more than two hundred pages, issued from the well-known press of Messrs. Ginn & Co. of Boston. It has been delayed almost unpardonably long, and yet its make-up and the character of its contents compel us to forget the delay, and confess that it was well worth waiting for. The plates alone would make the journal unique among American periodicals devoted to the subject; for they are mostly from the hands of Werner and Winter, the Frankfort (Germany) lithographers, whose names alone are ample guaranty of excellence. In brief, the journal appears to us admirable in almost every particular. The paper is good; the press-work is well done; the minor details of arrangement of footnotes, titles, headings, etc., give evidence of care and forethought.

In this periodical we have a substantial token of the progress of two distinct undertakings of which all American scientists ought to be proud. The first is that of Dr. Whitman, the editor, whose hope and struggle for many months have been to set going in the right way a zoölogical periodical that shall worthily represent American morphologists before the world, and be a suitable outlet for our strong and increasing zoölogical literature. Professor Whitman has certainly succeeded in making a good start.

A word is due also to the publishers, Messrs. Ginn & Co., for their courage in undertaking such a periodical, which can never be expected to be a financial success, as the demand must always be extremely limited. The difficulty of establishing such a journal will be the better understood when we consider that the proceedings of societies, supported by large endowments, meet with practically no sale, but are distributed throughout the world by exchange, and furnish a very excellent means for the placing on record of such papers as are given in this magazine.

The other undertaking is that of Edward Phelps Allis, Jun., of Milwaukee, with whose co-operation the journal is edited by Dr. Whitman. Mr. Allis first formed, and then put into active operation, the idea of a private biological laboratory of research. For this he was fortunate to secure Dr. Whitman as director, and to it the name of the 'Lake Laboratory' has been given. Besides the director, Mr. Allis has added to his laboratory Dr. William Patten as assistant, and it is understood that Mr. Allis is himself at work upon important investigations.

NOTES AND NEWS.

In September a school of Oriental languages was opened at Berlin, the object of which is to give merchants and civil officers an opportunity to learn the languages of Asia and Africa. The staff of the school consists of two teachers of the Arabian language, while Persian, Chinese, Suaheli, and Herero have one teacher each. These have studied the languages they teach in the country where it is spoken, and they are assisted by natives. This school will undoubtedly prove of great value to the commerce of Germany with the countries of Asia and Africa. The merchant or consular official who understands and speaks the language of the country in which he lives and works will have a great advantage over competitors who have to make use of the service of interpreters. Formerly students had the opportunity of studying Oriental languages at German universities, but there they were taught from an exclusively scientific point of view; and it is well known that a language learned in this way, though its grammar may be well mastered, is of no practical value to the student, particularly where the difference between the written and spoken languages is great, and where the dialects are numerous. In the new school the languages are taught as living languages, and this gives the institute its principal importance.

— The semi-annual session of the National Academy of Sciences will be held at Columbia College, Nov. 8, at noon, and continue for three or four days.

— The question of teaching physiology and hygiene to elementary classes in the public schools is one that is far from a successful solution. With a criminal rashness, legislatures have been induced to prescribe alcohol-teaching as a requirement, and the result has been to create noxious temperance-tracts with a smattering of physiology attached, instead of scientific text-books. A very great improvement in this direction is a recently issued primer of health lessons by Dr. Jerome Walker. Around the main facts of physiology, the author has woven an attractive text, fully and well illustrated, and has given the subject that kind of interest which healthy children appreciate. He has very much reduced the space usually allotted to alcohol and narcotics, but it may be questioned whether the reduction is sufficient. A few very objectionable passages (considering the age of the children to whom the book is addressed) still remain. On the whole, Dr. Walker has set an example in the right direction, and the instruction to teachers is not the least valuable chapter in the book.

— One of the subjects discussed at the annual meeting of the French Association for the Advancement of Science, which has just been held at Toulouse, was the project for making a maritime canal between Bordeaux and Narbonne. The different phases of this project, which was first mooted twenty years ago, were passed in review by M. Wickersheimer, deputy for one of the departments through which the canal will pass. The latest project was prepared this summer by a company which has been formed for the purpose of making the preliminary survey; and according to this scheme, the canal, which would be about three hundred and thirty miles in length from sea to sea, would start from the western side of Bordeaux, and follow the left bank of the Garonne for a distance of fifty miles, crossing that river at Castel-Sarrasin by a *pont-canal* (or aqueduct), and follow the right bank of the river as far as Toulouse, where a large port would be created. From Toulouse to the Mediterranean seaboard at Narbonne, the maritime canal would be quite independent of the railway from Bordeaux to Cette, but it would twice cross the Canal du Midi. The curves of the canal would be of the same radius as those in the Suez Canal; that is to say, not less than 6,000 feet, and there would be 38 locks, the fall of which would range from 20 feet to 30 feet. The depth would be about 24 feet, but if the minister of marine should determine to make use of it for the first-class ironclads of the French navy, contrary to what was originally determined, the company will be prepared to make it three feet deeper. It is estimated that the mean speed of vessels passing through the canal will be seven miles an hour, and they would be drawn by locomotives running along a line of rails placed on the banks, a force of from 1,000 to 1,200 horse-power being required to produce this rate of speed. The canal is to be lighted by electricity, the electric light being generated upon the engines used for the traction of the vessels. The total cost is estimated at £130,000,000, or less than half of the estimate originally prepared. The distance saved for vessels coming from the western ports of France into the Mediterranean would be 680 miles.

— It is noted in the *Journal of the Society of Arts*, London, that while the consumption of the other dietetic articles used for beverages — tea, coffee, and chiccory — show a decline last year, cocoa is marked by a considerable increase. This is remarkable, since for about four years, from 1875 to 1879, it remained pretty stationary at about 10,000,000 pounds, but after 1880 it began to make steady progress, advancing from 10,500,000 pounds in that year to over 15,000,000 pounds last year. Of powdered cocoa and chocolate England received 1,332,000 pounds, chiefly from Holland. She

also imported 3,211 hundredweight of husks and shells of the cocoa-bean, which are also used up for cheap cocoa. There are about ten chocolate and cocoa manufacturers in Holland, whose yearly requirements of cocoa-beans may be estimated at 3,000 tons, in round numbers, principally of Guayaquil, Caracas, and Domingo kinds. They mostly manufacture cocoa preparations, known by the name of soluble cocoa, cocoatine, and cocoa-powder; viz., the roasted and powdered cocoa-beans deprived of most of their natural fat, or the cocoa-butter, which is used as a valuable ingredient by manufacturers of chocolate and cocoa sweetmeats, and also for pharmaceutical preparations. In the early part of last month no less than twenty-five tons of this cocoa-butter was sold in Holland, and fifty tons in London. The oldest of the Dutch cocoa-works was founded on a small scale more than a century ago, and most of the other works have existed from forty to sixty years; but all of them remained insignificant until the before-mentioned powdered preparations found their way to foreign countries, especially England and Germany, where certain Dutch brands of powdered cocoa have been very well received and enjoy a large sale. There are people who suppose that the superiority of the Dutch cocoa-powder is to be attributed to a peculiar mode of manufacture, different from the methods followed in other countries. The idea to extract the fat from the roasted cocoa-beans, and to sell the powder, is said to have originated in the brain of a Dutch chocolate-maker about 1830. It is now generally practised in France and England. The average consumption in the United Kingdom last year, per head of the population, was, of cocoa, 0.41 pounds; coffee, 0.86; tea, 4.87. Tea brings into the revenue £4,500; coffee, only £200,000; and coffee mixtures and chiccory, £5,273. The latter seem to be declining.

LETTERS TO THE EDITOR.

*** The attention of scientific men is called to the advantages of the correspondence columns of* SCIENCE *for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Recent Methods in the Study of Bryozoa.

IN *Science* for Oct. 7, Prof. Joseph F. James refers to certain new methods in the study of *Bryozoa*, and doubts their efficacy in classification; he also refers to a forthcoming publication which shall make this clear. Pending the publication of this paper by my esteemed friend, I cannot help expressing my decided approval of the methods he calls in question. Theoretically, development has proceeded in two lines, — one internal, to accommodate itself to the needs of internal function; and one external, to accommodate itself to environment, to the world with which the being comes in contact. Variations of function are far less frequent than those of environment: hence internal structure may still be very similar when external features have already extensively varied. Hence internal structure usually furnishes the reliable characters, which distinguish genera and higher groups; external features are used for specific determination.

Very few who have practically attempted the classification of paleozoic *Bryozoa* into genera as defined according to the old method have failed to see that such genera contained heterogeneous assemblages of forms, often ran into each other, and contained no distinct positive characters which were useful when great numbers of *Bryozoa* were to be classified. The new method has furnished solidity to this structure. The species fall into easily recognized groups, as distinct as those of other organisms on the same scale of development; all this simply because of the abandonment of external characteristics in the distinguishing of genera, for those of an internal nature, made easily accessible by the slide and the microscope.

In this department of study, Prof. H. A. Nicholson took the first decided stand, and is still contributing at short intervals valuable papers on this interesting group of fossils; but I believe that to one of our fellow-countrymen, Mr. E. O. Ulrich, belongs the credit of the perfection of this system. His work, which expresses his matured views on this subject, is now in the press, forming a part of Vol. VIII. of the forthcoming 'Illinois Report.' By his kindness I have been permitted to see plates, and furnished with private extracts from the same, and I feel free to say that it will be a monumental work in history of the study of *Bryozoa*.

The practical test of the theory of development, which holds good everywhere else in animated nature, is also satisfactory here. Instead of artificial we have natural classification, and that also of a more definite and practical form. It remains to be seen whether microscopic sections are sufficient to determine the species. A circumstance peculiar to *Bryozoa* makes this in almost all cases possible. The form, size, and arrangement of cells may be readily seen in tangential section; the presence of interstitial cells may also be thus discovered; whereas the little elevations or low spines around the apertures of some cells may be seen in the sections as spiniform tubuli. Elevated patches of cells may usually be recognized by the local increased size of cells in the sections, and maculæ will be shown by judicious longitudinal sections.

It remains to be seen what characters of specific importance cannot be shown in microscopic sections. One of these is the size of the specimen; another, its method of branching; a third, its general contour. These may all be expressed by a simple drawing, taking no cognizance of individual cells. Besides the details above referred to, microscopic slides will of course furnish numerous others referring to internal structure alone. The fact, however, is, that not only do microscopic slides reveal the characteristic features of the surface, but they often reveal them in a much better way than the specimens at hand; for these may be abraded, perhaps ever so little, but just enough to rub away the little spines, or to remove the walls of interstitial cells, and, by thus exposing the diaphragms of the same, lead to the conclusion that they do not exist. Any one who has ever looked over a quart-measure of specimens without finding one suitable for description will know what this means.

As regards the publication of Mr. Foord, 'Contributions to the Micro-Paleontology of the Cambro-Silurian Rocks of Canada,' it is an excellent exemplification of the *methods* (for this is what Professor James criticises) of the advanced school of students of the *Bryozoa*, and is a practical recognition of the merits of a work done by an American paleontologist. All of the species figured are accompanied by magnified sections of the same, and all except *Monticulipora Westoni* have also figures of the specimen's natural size; and perhaps the shape of that species, "Zoarium irregularly hemispherical," would not be difficult to grasp by the working paleontologist. The fact that Prof. H. A. Nicholson, immediately after the separation of Mr. Foord from the Geological Survey of Canada, was pleased to publish papers conjointly with that gentleman, serves to show what that eminent authority's opinion as to the merits of Mr. Foord's specific work was.

These remarks I hope represent fairly the claims of the new school as to the advantages of their methods of study. One observation alone remains to be made. I suppose that Professor James was not in earnest when he objected to the new method on account of the difficulty of making slides, no more than the physicist who should object to the advance made in his science simply on account of some of the refined mechanisms now used in his department, no more than the student of *Entomostraca* who should object to the classification reached in his science from the difficulty in finding a specimen which is willing to be quiet enough to let itself be accurately drawn. He simply expresses the difficulty he finds in leaving his old methods of study and adapting himself to new ones, and this accidentally escaped into print, not in the form in which he would be willing to have it remain at second thought. But the truth is, that microscopic slides are not difficult to make. Messrs. W. F. and John Barnes of Rockford, Ill., manufacture an instrument which I know from experience to be both cheap and useful. The specimen to be cut is ground with emery until a plane is formed having the same direction as the intended section. Then successively finer grades of emery are used until a fine polish is obtained, which can be made very fine indeed by using polishing-powder sprinkled over a piece of plate glass. Then the specimen is carefully washed, dried, and glued with Canada balsam to the slide which is to retain the specimen. Then the specimen is ground away until only a thin sheet remains fastened in the Canada balsam, after which it is again smoothed, washed, and protected by a thin cover-glass. Forty to sixty slides can be made in a day.

Some of my first slides I find useful to this day, and every day adds experience, or a word from some friend working in the same field. The difficulty of making sections is a myth.

Cambridge, Mass., Oct. 31. AUG. F. FOERSTE.

Search for Gems and Precious Stones.

IN reference to the interesting article of Prof. P. L. Simmonds on the search for gems and precious stones, read before the Society of Arts of England recently, reprinted in your issue of Oct. 14, allow me to suggest a few corrections. Professor Simmonds estimates the yield of the Brazilian diamond-mines at £800,000 annually, while a little later on he says that the yield has dwindled to 24,000 carats, which, at the outside will not yield more than £2 to £3 a carat, and that of India, Borneo, and Australia at £200,000, when these latter figures would probably cover the annual product of Brazil as well as that of the other three countries named. Australia produces so very little as scarcely to be a factor in the computation. Even before the opening of the African mines, in 1867, the estimated value of the product of Brazil from 1861 to 1867 was only £1,888,000, or something over £300,000 per annum, at a time when Brazilian diamonds commanded a higher price than at present, and now they produce much less. His statement that the opal is out of fashion would have been true several years ago, but is not to-day, when more of these stones are sold, and at better prices, than ever before.

The carat is given as 3.174 grains; whereas, since there are 151.5 English diamond carats in an English Troy ounce of 480 grains, an English carat would be 3.1683168 Troy grains, or, less exact, 3.168. A diamond carat is always divided into four diamond grains equalling .792074 of a Troy grain. If 31.103 grams equal an English Troy ounce, a carat would be .205304 of a gram.

An international syndicate composed of London, Paris, and Amsterdam jewellers, wishing to establish a uniform carat, in 1877 confirmed .205, however, as the true value of a carat, in which case we have 151.76 carats in an ounce Troy.

These may seem trifling differences, but yet they are enough to affect a $10,000 lot of diamonds, worth $100 a carat, to the amount of $4.83 between the 3.174 carat and the 3.168 carat, and $19.80 between the former and the syndicate carat.

It would perhaps have been better to make the reference to imperial jade, which he mentions several times, under the head of the jade-quarries of Burma, as this (*Feitsui*) imperial jade is jadeite, not jade, and is generally only emerald green in spots or streaks, the mass being a dead white, lending a vividness to the green which occasionally almost rivals the emerald, and has the hardness of 7.

Of the articles of jade shown by the New Zealand Court at the colonial exhibition, England, Professor Simmonds says, "Evidencing the skill of the Maoris in working this hard material, the second in this respect to the diamond, although much more fragile," etc. This would lead one to infer that the material possesses great hardness, when, in fact, the hardness of jade is only 6.5, less even than that of rock crystal, and it can be worked with sand, by which laborious means, undoubtedly, all of the aboriginal ornaments of the Maori were made. So far as its fragility is concerned, it is the toughest of all known minerals, and this is the reason why it is so difficult to work. It would require less time to polish twenty surfaces of agate, which is harder than jade, than it would to polish one of jade on the same wheel. Krantz, the mineral-dealer of Bonn, having a fifty-pound piece of jade which he wished broken into small hand specimens, a friend kindly offered him the use of a large half-ton trip hammer to break it with. At the first blow the hammer was demolished, and the jade was only fractured by being heated and thrown into cold water.

We frequently hear minerals or gems loosely spoken of as second or third in hardness to the diamond. On the Mohs scale of hardness, the diamond is represented by 10, the sapphire by 9, topaz 8, and quartz 7; but, although the difference on the scale is only 1, there is room for several substances between the diamond and the sapphire; and, as we have no such known substance in nature, we place diamond on 10. In reality, so great is the difference between these two substances, that, if the hardness of the sapphire is 9, that of the diamond would be fully 100, relatively to the rest of the scale. Professor Simmonds also says that coral has the hardness and brilliancy of agate. Quartz and agate are placed at 7 in the Mohs scale, whereas coral has only the hardness of about 3, the same as that of marble (calcite), and can be scratched by fluorite. It is impossible to see how this opaque substance can be said to "shine like a garnet, with the tint of the ruby."

A word, in closing, about the hardness of agate and rock crystal. Mineralogically these are classed together at 7; but in reality the crystalline varieties should be 7, and the crypto-crystalline varieties 7.3, since they will readily scratch quartz, and quartz will not scratch them. GEORGE F. KUNZ.

New York, Oct. 31.

Living Lights.

WE have noticed in your journal (*Science*, x. No. 246) a review of the book on phosphorescence called 'Living Lights.' The writer, it seems, must have made a very hasty perusal to have failed to see that the statements therein are not conjectural, but in each case are from individuals we are accustomed to honor as credible witnesses.

The fact of this review being in the columns of a science journal is, of course, the only reason for our interest in it. The most charitable construction which we can put on this surprising exhibition of lack of knowledge is that the reviewer did not notice the array of great names which support the statements of the book, for we cannot think that any one would knowingly dispute the words of such men — and naturalists.

The reviewer starts off by throwing discredit and ridicule on the entire world of luminosity, seemingly denying that attribute to all living objects. He says, "Not only do fire-flies fly, glow-worms glow, zoöphytes twinkle in the sea, but sea-anemones, alcyonarians, gorgonias, star-fishes, earth-worms, crabs, shell-fish, lizards, frogs, toads, fishes, birds, monkeys, and men must be added," etc.

We confess to embarrassment in approaching the task of replying to such, for one is impressed with the notion that some occult jest is intended; but again we are reminded of the character of the journal, and a feeling of surprise follows at the incomprehensible lack of knowledge displayed regarding the subject in hand.

The reviewer continues, "There is no excuse for conjectural illustrations, and ideal views of possible appearances." Shall we inform him that twelve of the plates in 'Living Lights' are process copies taken from lately published bulletins of M. Filhol, M. Dubois, and from sketches of the deep-water dredged objects obtained by the gentlemen of the 'Challenger,' 'Travaileur,' 'Porcupine,' 'Majenta,' and others, several of whom kindly furnished the author with advanced papers for use in his work?

Thus for twelve of the illustrations: for the remaining ones, it were absurd indeed to defend them. The former, as being matter not yet widely extant, some of it not published outside of society bulletins, may well be regarded as unfamiliar. The quotation which the reviewer takes from the book is treated so as to mislead. The author evidently meant to convey that it is difficult to represent the phenomenon of luminosity in marine animals, as their integrity is injured on exposure to air, though no question is entertained of their luminosity. A kindly review of this portion would rather praise the caution exhibited by the author in stating that the pictures may possibly not exactly portray the real appearance as it exists in the sea. The statements of the reviewer are so sweeping and (possibly) damaging among those not informed, it would seem advisable to state facts, though it is a humiliating thought that the brilliant work of so many eminent men should in such quarters be unknown.

It is but justice to do this, as the author of 'Living Lights' is at present beyond reach, at a distance from home, and of course unable to reply seasonably.

The statement, "zoöphytes twinkling in the sea" might well have covered the ground for one group, without enumerating "sea-anemones, alcyonarians, gorgonias," etc., also; but this enumeration will serve to suggest what objects concern us, as those arraigned for false attributes. We presume that few will deny the luminous gift to fire-flies, glow-worms, etc., which are mentioned in this connection. Let us, then, pass to the sea-anemone record. Colonel Pike of Brooklyn, an American naturalist not to be questioned, has given at length his testimony, and we know that the author himself has an experience as to their luminosity, which,

coupled with that of Van Benedin and numerous other European zoölogists, we assume is weight enough to give respectability.

The luminosity of gorgonias, sea-worms, star-fishes, etc., is a well-known fact to us from long residence on the Florida reefs; but, should it be desirable to fortify such evidence, we would refer to testimony of Sir Wyville Thompson, and several other successful dredgers.

It would have saved somewhat of the task of this *exposé*, had the reviewer read the history of the *Brisinga*, the luminous star-fish, which 'Living Lights' gives amply, and illustrates by process picture from the original, through courtesy of M. Filhol and M. Dubois, the latter having had some of the dredgings of the 'Talisman' for examination. The work of Charles Abjordsen of Norway, on the luminosity of this creature, is also extant, who pleasantly named it *Gloria maris*. M. Quatrefages may also be called to testify, if need be, whose valuable work on the luminosity of the star-fishes is well known. P. Martin Duncan and some others are remembered in this connection.

The crustaceans are next summoned to show cause. Must we arraign our own Verrill and Smith? Shall the ancient Viviani be questioned? May we lightly dispute the words of Nordenskiöld, Giglioli, Sir Joseph Banks, MM. Eydoux and Souleyet, Norman, Vaughn, Thompson, Murray, V. Willemoes Suhm, and a host of others whose descriptions of the luminosity of crustaceans are not in sober earnest to be called "displays of pyrotechnical natural history"? The attractive picture of *Colossendeis*, copied from M. Filhol's delightful work, is one with others which the reviewer chooses to designate as "conjectural illustrations" and "ideal view for which there is no excuse."

Regarding fishes, Dr. Gunther's views and statements are considered good science. His kindly correspondence with the author pleasantly confirms all that he has written on phosphorescence of fishes.

M. Carlo Emery, of the Italian Zoölogical Schools, kindly communicated his experiments to the author, with drawings, on the luminosity of the insect *Lucciola italica*. It were better due this eminent naturalist in the pages of an American science journal to acknowledge his original investigations in the spirit of science, rather than pronounce them examples of "pyrotechnical natural history," etc.

It certainly cannot be necessary to go further; but as the picture of a heron was particularly mentioned as "distinctly misleading," etc., it may be well to direct attention to the facts in the case. Attention to the text will show that the author carefully and at much trouble set about gaining, if possible, any additional knowledge concerning the alleged luminosity of the breast of the night-heron. It has long been a widely known belief among hunters that the powder-down patches on the heron's breast are at times luminous. We have learned from very many ornithologists that the belief was familiar to themselves, and in general there is an inclination to consider it true. The editor of 'Living Lights' received some remarkable confirmations of the long-existing say-so, and in his book plainly exhibits several of the most convincing, — no less than positive statements in answer to categorical inquiries by the author.

It chanced that we were able to ask the opinion of the eminent English naturalist, Mr. Alfred Russell Wallace, to whom this subject was familiar. He expressed readiness to believe the existence of luminosity in such birds, notwithstanding the literature on the subject is so meagre, and quoted the well-known case of the lantern-fly. Mr. Wallace was an explorer in South America, as is well known, and in answer to our question he said, "I did not observe the phenomenon of luminosity in the lantern-fly, but Madam Mérian, the distinguished entomologist, and the Marquis Spinola, did; the former giving detailed accounts of several which emitted such powerful luminosity, on opening the box in which they were confined, that she was alarmed. I am therefore not entitled to deny the statements."

Regarding the higher animals and man, as in relation to the phenomenon of luminosity, the long-recorded example of the brilliant eyes of the South American monkey should be regarded; and if the statements concerning man, as published by Dr. Phipson in his nearly unique treatise on this subject, as quoted by the author, are not entitled to respect, and protection from the assertion that such "statements are distinctly misleading and wrong . . . and highly colored, and admitted on very slender evidence," then we have no remedy.

In a few words, the considerable fresh material in 'Living Lights' should have received favorable notice; for, added to the large amount of facts in marine zoölogy long familiar to the author through actual personal contact with marine life on all parts of our coast, on the extreme northern and on the Florida shores, and on the two oceans, here is presented noticeable examples of luminosity in every grand division of zoölogy, and in the vegetable and mineral worlds, all furnished by the eminent zoölogists, with accompanying figures, which the reviewer has chosen to ignore or ridicule.

The amount of information and data obtained by the author through the United States Fishery Commission is very great, and it is due to the memory of the late lamented commissioner to say that the work of the 'Albatross' and 'Fish Hawk' exceeds all others in the contributions to science derived from the deep-sea dredgings. The history of luminous marine animals, judged by those acquainted with marine zoölogy, is by no means exhausted.

A.

New York, Oct. 26.

Sorghum-Sugar.

IN an article under the above caption published in *Science* about a year ago (viii. p. 361), I ventured to make the following prediction with reference to the experiments which were being carried on in Kansas under the direction of the United States Department of Agriculture: —

"The indications from the present results are most hopeful, — that, with the expenditure of a small fraction of the money and brains that have been required to develop the sugar of the beet, the sorghum-sugar industry will take a leading place among American industries, and enable Uncle Sam to accomplish a long-cherished hope, viz., of making his own sweets."

The results of this season's work, while it is not yet fully completed, would seem to show that this prediction is in a fair way to be fully confirmed within a very few years, for a great advance has already been made towards the solution of the problem of the profitable production of sugar from sorghum.

The final outcome of last year's work was extremely discouraging to many friends of the industry, and it was only by strenuous efforts on the part of the few who still retained their faith, that the necessary appropriation for the continuation of the experiments could be obtained from Congress. Many thought that the question would be definitely settled by the experiments last year, and, as the results achieved were chiefly of a negative character, they considered that it was proved a failure. Perhaps too much was expected to be accomplished in so short a time. It has often been the case with great undertakings, and in the accomplishment of scientific problems, that their prospect looked darkest just before the dawn of their success. Such has been the case with sorghum-sugar. Negative results frequently contribute greatly toward ultimate success, and the lessons taught by some of last year's failures have been turned to very valuable account in this year's work.

The two difficulties mentioned in the article referred to as encountered in last season's work — viz., the cleaning of the chips, and the treatment of the juice — have been successfully grappled with. The former is accomplished by ingenious yet simple mechanical devices. The cane is fed, leaves and all, to an ordinary ensilage-cutter, which cuts it all into pieces about one and a half or two inches in length. These are carried to a height by an elevator, and thence dropped through a series of separating-fans, where the refuse, consisting of the blades and sheaths, is blown out; its separation from the sections of cane being quite complete on account of the much greater weight of the latter. The cleaned pieces of cane are then carried to a small cylindrical cutter, whose operation is very similar to that of a planing-machine, and which cuts the cane into quite small chips, or shreds. Thus the diffusion is effected upon well-cleaned cane, — a fact which doubtless contributes greatly to the purity of the juices obtained. The inversion of the juice in the cell, which is very apt to occur with sorghum on account of its large content of various vegetable acids, is controlled by the use of precipitated carbonate of lime, which is added to the contents of

each cell. By this a considerable proportion of these acids is neutralized. In the treatment of the juice the solution of the problem seems to have rested rather in the simplification of the method to be used than in its further complication. In fact, it is really a return to first principles, as it were; for the method which was finally adopted, and which has given such excellent results, is the old method of liming the juice to a slightly alkaline re-action, and boiling and skimming in an open pan. No filtration is used whatever, the scums being simply returned to the cells, where they are again extracted, so that no loss of sugar is sustained. Treated in this way, the diffusion juice shows a higher coefficient of purity than juice obtained from the same cane by pressure, also an increased ratio of sucrose to glucose.

Single experimental runs have given a yield as high as one hundred and thirteen pounds of 'first sugar' to the ton of cleaned cane, with seventeen and a half pounds of 'second sugar,' or a total of one hundred and thirty pounds to the ton. This is at least twice as large a yield as has ever been obtained by pressure extraction, even under the most favorable conditions. The results on the season's work have not yet been ascertained.

The people of Kansas are highly pleased over the results of the work so far, and, with characteristic Western energy, are preparing to rush into the sugar-business immediately, and make Kansas, in the language of the local newspapers, 'rival Louisiana' as a sugar-producing State. A few words of caution to these would-be sugar-growers might not come amiss. No industry requires more careful management, or a greater amount of scientific knowledge and skill, to make it a success, than the production of sugar. In order to compete with other sugar-producing countries and plants, the most careful system of cultivation should be combined with the most skilful and economical methods of manufacture. The beet-sugar industry of Europe may well serve as a model in this respect, in that the proper cultivation of the beet-roots is regarded as of prime importance, and in the manufacture of the sugar every pound of waste or by-product is utilized, and every ton of fuel is made to yield its maximum equivalent of power. The most careful and thorough scientific supervision is exercised over the entire process of manufacture. At the present prices for sorghum-seed, which is in great demand for planting for forage purposes and for the sirup, a yield of any thing in the neighborhood of one hundred pounds of sugar to the ton of cane would afford a very wide margin on the cost of production, since the cane can be grown for one dollar and fifty cents per ton; but the success of the industry would necessarily involve the reduction of the prices for these important by-products to a much lower figure, and cut off a very considerable proportion of the present profits in the production. On the other hand, much is to be hoped from the apparently great adaptability of the plant to the soil and climate of a large area of this country, and from scientifically conducted experiments for the increase of its saccharine content. Judging from analogy, it is reasonable to expect that the latter can be greatly increased by the well-known methods of selection and cultivation. Sorghum-cane has been grown on the grounds of the Department of Agriculture at Washington, which contained as high as eighteen per cent of sucrose in the juice, or sixteen per cent of the cane. If a field of sorghum could be raised which would average fifteen per cent of sucrose without too great an expenditure for cultivation, the question of the profitable production of sugar from the plant would be solved at once.

This much, at least, can be said of the experiments that have been carried on by the Department of Agriculture: they have shown that good marketable sugar can be made from sorghum-cane in sufficient quantities to pay at the present prices for the products and by-products of the manufacture. The question as to whether we are to have a national sugar-industry in the United States will probably work out its own solution before many years.

These experiments in the manufacture of sugar should have a particular interest for scientific men, for their success means not only a triumph of science, but also a complete vindication of the policy of giving governmental aid to scientific investigations. The development of the sorghum-sugar industry so far has been carried on entirely by the Department of Agriculture, with appropriations made by Congress for that purpose. Numerous objections have been raised against these appropriations, and both loud and deep have been the repinings as the years went on and no practical outcome was obtained. In case they are crowned with ultimate success, these objectors will be most fitly answered; for the money spent would be but as a molecule of water to the Mississippi River in comparison with the stream of wealth which would flow from the establishment of a national sugar-industry. Let us hope the lesson will have its effect upon the people in the adoption of a still more liberal policy in aiding scientific research in the future. The experiments in the application of the diffusion to Louisiana cane will be commenced some time in October. From the favorable results which were obtained last fall at Fort Scott in operating upon a few carloads of cane after the close of the sorghum season, it may reasonably be expected that the yield obtained will be very satisfactory, although the problem is somewhat more difficult than in the case of sorghum, as the results obtained by mill-extraction from the Southern cane are much superior to those obtained from sorghum.

C. A. CRAMPTON.

Fort Scott, Kan., Oct. 23.

The Purslane-Worm.

IT may be of interest to note that the 'purslane-caterpillar,' described in a recent number of *Science* (x. No. 246), has made its appearance at this point; at least, a new species of caterpillar, new to all observers, and feeding on purslane, has made itself very conspicuous for a few months past. In this vicinity the early summer was very dry, and the purslane, which is not yet so common a weed with us as farther east, was not very plentiful. But late in August, after a series of heavy showers, it sprang up, *more suo*, abundantly, and with it came this stranger in such numbers as to attract the notice of one quite unlearned in such matters. Both the plant and its boarder flourished along the line of a railroad leading south-east into Kansas, from which State it is in all probability an emigrant; but, if so, one would think that it must have advanced farther last season than your Kansas correspondent noted.

GEO. M. WHICHER.

Hastings, Neb., Oct. 25.

Queries.

16. PENNSYLVANIA POT-HOLES. — Can you tell me where I can find an account of the glacial pot-hole noticed in your 'Notes' in No. 246? I presume it may be in some volume of the Second Geological Survey of Pennsylvania, but I do not know which one. Perhaps some of your readers can say, if you cannot.

JOSEPH F. JAMES.

Oxford, O., Oct. 23.

17. DOES BITUMINOUS COAL CONTAIN ANY BITUMEN? — Many text-books and dictionaries define bituminous coal as containing bitumen, and mislead the student into the belief that its name is due to this fact. In Vol. VI., 'Encyclopædia Britannica,' ninth edition, Mr. H. Baurerman, F.G.S., Royal School of Mines, says on p. 46, under the subject coal, "The most important class of coals is that generally known as bituminous, from their property of softening, or undergoing an apparent fusion, when heated to a temperature far below that at which actual combustion takes place. This term is founded on a misapprehension of the nature of the occurrence, since, although the softening takes place at a low temperature, still it marks the point at which destructive distillation commences, and hydrocarbons both of solid and gaseous character are formed. *That nothing analogous to bitumen exists in coals, is proved by the fact that the ordinary solvents for bituminous substances, such as bisulphide of carbon, and benzole, have no effect upon them, as would be the case if they contained bitumen soluble in these re-agents.* The term is, however, a convenient one, and one whose use is almost a necessity from its having an almost universal currency among coal-miners." Impressed with the above statement, and recognizing its importance to teachers of science especially, I call attention to it, under the head of 'Queries,' that hereafter truth shall be taught, and not error. I sometimes entertain a suspicion that many errors continue to be accepted as facts, because writers simply copy from their predecessors, instead of actually testing or proving them to be facts.

GEORGE GLENN WOOD, M.D.

Muncy, Penn., Oct. 28.